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A Re-Examination of Ontario's 24 Hour Ambient Air Quality Criterion for Hydrogen Fluoride

The Ontario Government's Ambient Air Quality Criteria for gaseous hydrogen fluoride of $0.86 \mu\text{g}/\text{m}^3$ for 24 hours was established in 1974. The criteria is based on the most sensitive receptor in the environment to gaseous hydrogen fluoride which was determined to be vegetation. The level was set using results from the literature available at the time (Adams et al., 1956). In recent years there has been pressure from concerned industries to raise the 24 hour criteria to a higher value similar to that used in the United States. As there has been no new literature relating to short term exposures since the criteria was set in 1974 a standards development project was established at the Ministry of Environment, Phytotoxicology Section, Controlled Environment Laboratory to look into the validity of the current 24 hour criteria.

Three species, Manitoba maple (Acer negundo), apricot (Prunus armeniaca L.), and gladioli (Gladiolus sp. var. Snow Princess), were looked at in 1985. The 1985 work was repeated in 1986 using the same three species. The major difference between the 1985 and 1986 work was that older plants were used in the 1986 experiments in order to determine what affect plant age, stage of development and vigor had on their sensitivity to fluoride. In 1987 two varieties of tulip (Tulipa gesneriana L. var. Blue Parrot and Preludium) which are used as biological indicators of hydrogen fluoride in the Netherlands (Posthumus, 1976) were also tested.

All of the species studied accumulated fluoride in leaf tissue in a linear manner with increased fluoride dose. Only with gladioli and the Blue Parrot variety of tulip was fluoride content in the leaf tissue related to the amount of injury. The percentage of leaf tissue injured increased with increased fluoride dose in all four species but was

highly variable in the apricot and Manitoba maple. Genetic variability appears to be a major factor in plant sensitivity to fluoride. Ranking of the species with respect to fluoride sensitivity placed tulip, gladioli, apricot, and Manitoba maple in that order from most sensitive to least sensitive. The stage of plant development and rate of growth were determined to be significant factors affecting fluoride sensitivity.

Although fluoride injury was observed at concentrations near or below the Ontario Government's 24 hour Ambient Air Quality Criteria of $0.86 \mu\text{g}/\text{m}^3$ gaseous hydrogen fluoride, this level appears satisfactory for the protection of vegetation. Unlike other standards set by the Environmental Air Standards Setting Committee there is no apparent safety margin implicit in this proposed standard. The very slight injury observed at the lowest doses and the probability that plants growing in outdoor (natural) environments would not respond as sensitively is considered to create a safety margin.

This research will be submitted to an appropriate journal for publication. The published document will form the basis for the new formal standard document.

References

1. Adams, D.F., Shaw, C.G. and Yerkes, Jr. W.D. (1956). Relationship of injury indexes and fumigation fluoride levels. *Phytopathology* 46: 587-591
2. Pothumus, A.C. (1976). The use of higher plants as indicators for air pollution in the Netherlands. *Proceedings of the Kuopio Meeting on Plant Damages Caused by Air Pollution*. Kuopio. Lauri Kärenlampi ed. p. 115-120

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